CASE REPORT

Multiglandular parathyroid disease in young adult with chronic kidney disease: a case report

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ABSTRACT

Background: Parathyroid adenomas are uncommon in patients with chronic kidney disease (CKD) undergoing haemodialysis, where secondary hyperparathyroidism typically presents as diffuse parathyroid hyperplasia. The occurrence of multiglandular parathyroid disease in this population is exceedingly rare and poses diagnostic challenges.

Case presentation: A 23-year-old male with end-stage renal disease on haemodialysis presented with biochemical evidence of hyperparathyroidism, characterized by markedly elevated parathyroid hormone levels, low to normal serum calcium, and elevated serum phosphate levels.

Investigations: Neck ultrasonography identified two hypoechoic nodules inferior to both thyroid lobes. Dual-phase [^{99m}Tc] Tc-MIBI scintigraphy demonstrated focal tracer uptake in both regions on early and delayed images, consistent with bilateral parathyroid adenomas.

Diagnosis: Based on clinical, biochemical, and imaging findings, a diagnosis of bilateral parathyroid adenomas (multiglandular disease) was established in a dialysis-dependent CKD patient.

Discussion: Multiglandular parathyroid adenomas are exceptionally rare in young patients with CKD. The case emphasizes the diagnostic significance of advanced non-invasive imaging modalities, particularly Tc-MIBI scintigraphy, in differentiating adenomas from hyperplastic glands and localizing lesions accurately.

Conclusion: Recognition of atypical presentations of parathyroid adenomas in CKD patients is crucial to ensure timely and appropriate management, thereby preventing complications associated with persistent parathyroid hormone elevation and mineral metabolism disorders.

Keywords: Chronic kidney disease, dual phase MIBI scintigraphy, haemodialysis, parathyroid adenoma, secondary hyperparathyroidism.

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Introduction

In patients with chronic renal disease, secondary hyperparathyroidism is the most common parathyroid disorder, arising from chronic phosphate accumulation, diminished vitamin D synthesis, and hypocalcaemia, which together lead to uniform hyperplasia of all parathyroid glands [1]. In long-standing cases, nodular transformation or autonomous secretion may occur, resulting in tertiary hyperparathyroidism [2]. Unlike hyperplasia, parathyroid adenomas are clonal neoplasms causing primary hyperparathyroidism, and their occurrence in individuals with renal failure on dialysis is uncommon [3]. Detection of more than one adenoma is unusual, appearing in only 2%-5% of primary hyperparathyroidism cases [4]. The presence of bilateral adenomas or Multiglandular Disease (MGD) in young patients with chronic kidney disease (CKD) on dialysis has been scarcely reported. We report a case of multiglandular disease in a young adult with CKD on haemodialysis, identified on imaging.

Case Presentation

A 23-year-old male undergoing dialysis for chronic renal disease, was evaluated for refractory hyperparathyroidism. Biochemistry revealed markedly elevated parathyroid hormone (1050 pg/ml; reference range: 15-65 pg/ml), low-normal calcium (8.1 mg/dl; ref: 8.5-10.5 mg/dl), and elevated phosphate (6.8 mg/dl; ref: 2.5-4.5 mg/dl). At presentation, he had no prior history of parathyroid intervention. Neck ultrasonography revealed two well-defined hypoechoic nodules located inferior to the bilateral thyroid

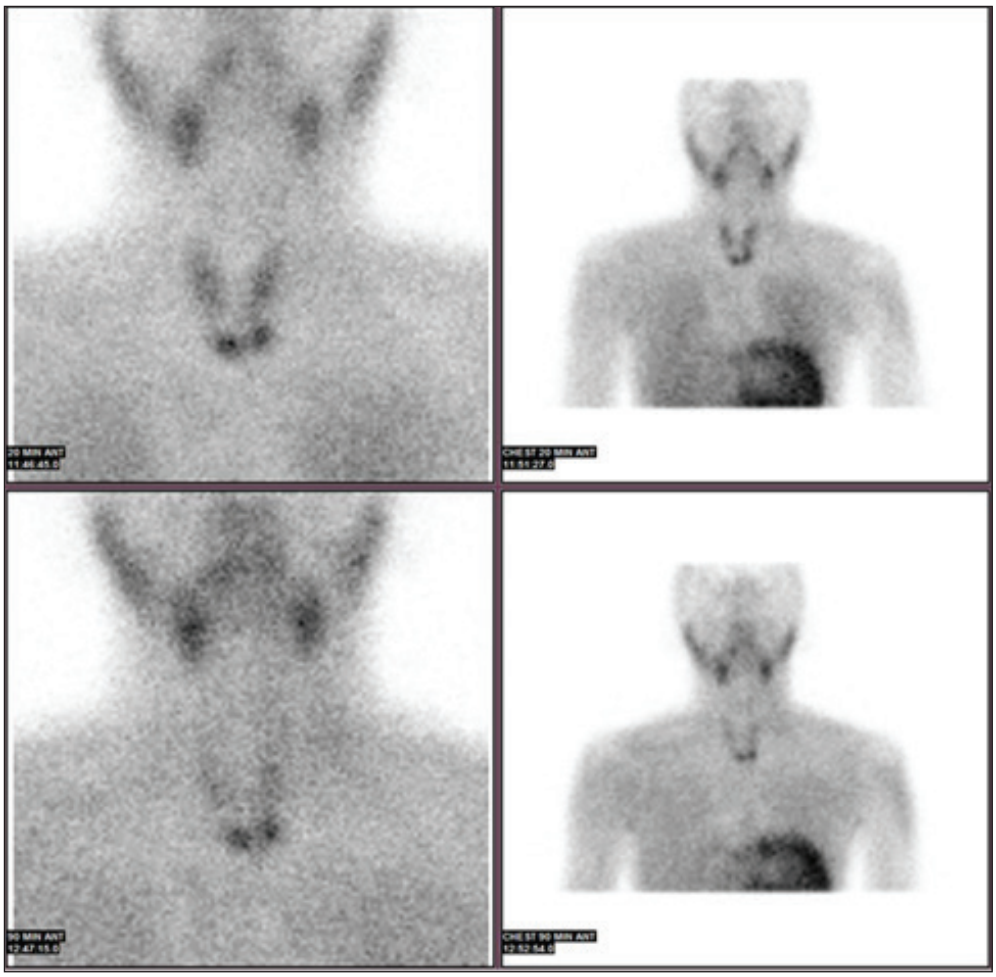

Figure 1. *Parathyroid imaging on early imaging 20 minutes and delayed 90 minutes.*

lobes, suspicious for parathyroid adenomas. To further characterize these lesions, dual phase [^{99m}Tc] Tc-MIBI scintigraphy was performed after intravenous administration of 20 mCi [^{99m}Tc] Tc-MIBI. Early planar images obtained at 20 minutes demonstrated focal radiotracer uptake inferior to both thyroid lobes. On delayed images acquired at 90 minutes, these foci showed persistent tracer retention, feature suggestive of parathyroid adenomas. No additional abnormal tracer accumulation was detected in the mediastinum. Based on the concordant findings from ultrasound and scintigraphy, a diagnosis of bilateral inferior parathyroid adenomas was established (Figure 1).

Discussion

According to Ketteler et al. [1] secondary hyperparathyroidism in CKD arises mainly from phosphate retention, vitamin D deficiency, and hypocalcaemia, usually leading to diffuse parathyroid hyperplasia instead of adenomas. Tominaga et al. [2] noted that chronic secondary hyperparathyroidism may progress to nodular or tertiary forms, generally involving multiple glands. Importantly, they did not identify genuine adenomas, highlighting the exceptional character of this case report. Silverberg et al. [3] demonstrated that most cases of primary hyperparathyroidism arise from a single adenoma.

Wang reported that only 2%-5% of patients with primary hyperparathyroidism have more than one adenoma [4]. Bilateral adenomas, such as those in our patient, are therefore unusual even in primary disease and are exceptionally rare in the dialysis population.

In a review, Fraser emphasized that primary hyperparathyroidism is usually caused by adenomas, while hyperplasia defines secondary and tertiary hyperparathyroidism [5].

Johnson et al. [6] focused on advances in parathyroid imaging, highlighting the utility of dual phase [^{99m}Tc] Tc-MIBI scintigraphy for detecting adenomas. Our case confirms their findings, with scintigraphy successfully identifying bilateral inferior adenomas.

Woods et al. [7] showed that subtraction scintigraphy improved the detection of parathyroid pathology in multigland disease, particularly when combined with dual-tracer techniques using Tc-99m-pertechnetate and Tc-99m-sestamibi. However, its sensitivity decreases in cases of parathyroid hyperplasia, small-sized adenomas, and in the presence of thyroid nodules. Thus, subtraction

scintigraphy being a useful tool in suspected multigland disease has important limitations.

Morris et al. [8] proved that ultrasonography, when used alongside dual-phase sestamibi imaging, plays an important role in confirming parathyroid adenoma by providing both structural and functional correlation. Adenomas typically retain sestamibi on delayed imaging, while ultrasound demonstrates a characteristic hypoechoic lesion adjacent to the thyroid. This combined approach improves diagnostic confidence, particularly for solitary adenomas. Therefore, ultrasound was used as an effective modality for this case report.

Kairemo et al. [9] investigated that SPECT/CT has become increasingly valuable in parathyroid localization due to its ability to combine functional uptake with precise anatomical correlation This technique enhances detection of ectopic or mediastinal glands and improves surgical planning by delineating the exact location of hyperfunctioning tissue. While its accuracy is higher than planar or subtraction scintigraphy, challenges remain in detecting hyperplasia or very small lesions, and the technique requires higher cost, longer acquisition time, and exposes patients to additional radiation.

Recent studies further confirm the rarity of our findings. Malipedda et al. [10] reported a case of multiple adenomas and carcinoma in a patient with tertiary hyperparathyroidism evaluated with [^{99m}Tc] Tc-MIBI. Alhefdhi et al. [11] described two adenomas in a dialysis-dependent patient with tertiary hyperparathyroidism confirmed surgically.

Yang et al. [12] presented an exceptional case of an intrathyroidal adenoma arising from a supernumerary fifth parathyroid gland in a patient on chronic dialysis. Collectively, these cases show that adenomas can occur in the dialysis population, though usually in older patients with tertiary disease and often requiring surgical correlation.

Rodríguez-Ortiz and Rodríguez [13] states that Parathyroidectomy is the surgical resection of the parathyroid glands and is considered in patients with hyperparathyroidism refractory to conservative medical therapy.

Several aspects of this case distinguish it from the usual clinical spectrum of hyperparathyroidism. In patients with chronic renal disease, diffuse parathyroid hyperplasia is expected as a result of chronic biochemical disturbances. The presence of adenomas in both inferior glands further amplifies the rarity, since bilateral adenomas are reported only in a very small proportion of primary hyperparathyroidism cases and are almost never seen in dialysis-dependent patients. The age of the patient adds another layer of exceptionality parathyroid adenomas typically occur in middle-aged or older adults, whereas their occurrence in a 23-year-old is exceptionally rare. Finally, the diagnosis in this case rested entirely on imaging with dual phase [^{99m}Tc] Tc-MIBI scintigraphy combined with neck ultrasound.

Conclusion

The case highlights the rarity of bilateral adenomas in patients with chronic renal disease and reinforces the pivotal role of non-invasive imaging in identifying atypical parathyroid lesions, guiding potential future management. Early identification of adenomas may decide future management strategies, including surgical or ablative options. Additionally, it underscores the value of non-invasive imaging ultrasound, and dual phase [^{99m}Tc] Tc-MIBI scintigraphy.

List of Abbreviations

MGD Multiglandular disease

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None

Consent for publication

Permission was obtained from the patient to publish the case and the accompanying images.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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